

CHARACTERISTICS OF CERTAIN WESTERN CICADAS

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Many differences exist in cicadas other than the morphological characters used in the taxonomic differentiation of genera and species. The habits, broods, locations, songs, seasons, plant associations, time and activities may be so constant that they may be typical of certain groups and may even be of value in the determination of closely allied species. With a knowledge of these factors, one may be reasonably certain of what species or group of species may be expected to be found under certain conditions.

The season for most of the far western cicadas is chiefly the early summer and by the latter part of the season, most of their visible activities are over with. *Okanagana* and the allied genera are dominant and *Tibicen* is represented by only a few species which are not typical of the genus in the east. By the latter part of July, the broods have scattered and only rarely can a song be heard. A record for *Okanagana bella* Davis is therefore unusual both for time and altitude. It was observed on September 19, 1932 in Utah County, Utah, east of Mt. Timpanoogas (altitude 11,957 ft.) in the valley known as Little Provo Hole at an altitude of approximately 9,000 feet.

All the determinations of the species considered here have been made by Mr. Wm. T. Davis of Staten Island, New York and he has reviewed the manuscript. Dr. Walter Cottam of the University of Utah determined the plants and John W. Sugden, III assisted in the collection. The author's thanks is expressed.

Cacama crepitans Van Duzee

This cicada was found (June 24, 1938) on the hills of the Coast Range, Orange County, California, east of San Juan Capistrano. They were on the steep hill densely studded with *Opuntia* cactus, but no insects were found on the cacti notwithstanding the

popular name "cactus dodger," but were always located on the other plants of the region and often were on dead twigs.

The song of the *Cacama*, markedly different from that of *Okanagana*, was given in sequences of ten to twelve seconds. During the first five or six seconds, the song was rapid and shrill and then it decreased through the remaining interval to be again repeated without break in the continuity. The change from the low, dull song to the high, shrill interval was rapid and that from the opposites was considerably longer, taking about one second of time. During the first part, the full song, the abdomen was elevated and the opercula widely opened. During the remaining period, the abdomen was depressed and the opercula were then closed. The depression of the abdomen and the closure of the opercula damped the sound and with the alternate opening and closing, the song had an undulating character. The same insect observed at Point Loma, California, several years ago (June 12, 1931) had the same undulating character but the variations were slight. Only in cicadas with opercula covering the tympanal cavities is such a song possible.

When captured there was a high-pitched, shrill, continuous song. Flying was during the low part of the song, not during the height with the abdomen raised.

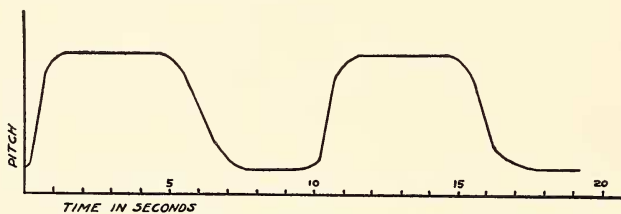


FIG. 1. Song of *Cacama crepitans* Van Duzee.

Clidophelps pallida Van Duzee

Clidophelps pallida was found in the valleys of Southern California (near Elsinore, Calif. June 24, 1938) on *Eriogonum*. There was a definite plant association and the insects were found wherever the plant occurred. When the insects flew they invariably lighted on the plant and not on other bushes or plants in the vicinity.

The characteristic song was a loud rasping rattle, very similar

in quality to the rattle of the rattlesnake. Many other cicada songs have been described as resembling this sound. Putnam (1881) writes that the note of *O. rimosa* is a "rattling noise, exceedingly like that of a rattlesnake. This resemblance was so close that one day in 1873, in the Shoshone Mountains, I was attracted by a noise which I took to be one of those insects, and stopped to pick it up, when I suddenly discovered a large rattlesnake in its stead" (quotation, Myers, 1929 p. 221 and Davis 1921 p. 50). Englehart states that the song of *O. schæfferi* "closely resembles the whirring noise produced by a rattlesnake and that on one occasion in June, 1917, in Washington County, Utah, he came very near being bitten by a snake while searching in a small bush for the supposed cicada" (quotation, Davis, 1921, p. 50). My notes concerning the same *Clidophelps*, observed in San Diego County, California (June 12, 1931) were much the same. The similarity to the rattlesnake rattle was definite. With the song of any of the Okanaganas, I have never had the impression of hearing a rattlesnake, however, the difference in the sounds may be more marked because of familiarity with the reptile.

During the time of the rasping rattle, the wings were flattened and slightly opened. This occupied about ten seconds of time and none that were timed continued longer than twelve seconds. Many of the insects in a location would give the rattle sound in unison. When it was started, several could be heard to start within a fraction of a second and all would stop at almost the same instant.

In addition, there was a clicking sound, during which the abdomen was jerked up and down. This sound was repeated at a rate as frequent as 140 a minute and could be counted with a watch, much the same as taking a fetal heart tone. When disturbed by being too close, the clicking was less frequent or discontinued. The insects depended upon concealing coloration and sometimes they could be picked from the stem without attempting to fly.

Okanagodes gracilis Davis

From a few miles north of Boulder City, Nevada (June 25, 1938) until off the plateau, the insects were found or heard

wherever a plant association occurred. Three plants predominated and were always together. The cicadas were found only on the first two.

1. The Bottle-plant, *Eriogonum inflatum*, a pale green, spindly plant with swollen hollow stems.

2. Burro-weed, *Franseria dumosa*, a small, grey, sage-like plant, growing from six to eight inches in height.

3. Creosote-bush, *Covillea tridentata*, an evergreen shrub with deep green leaves, growing about two feet in height and giving the only color to the region. It is the characteristic plant of the area, the Covillea belt.

At the time, the temperature was estimated to be 110° F., which was apparently too conservative as at Boulder City, the official reading in the shade was 114° F., and at Las Vegas, it was considered "very warm." Of course in the desert there was no shade. Time 11 A. M.

The song, a series of short "zips," was repeated, when not disturbed, at intervals of 160 a minute. When approached, the song was usually stopped or reduced in frequency and when it was resumed, a few chirps were given rather cautiously before starting the full song. Invariably the song seemed to be coming from a plant nearer than the one occupied by the insect. Even when allowance for error was considered, the site often was beyond the estimated location. When disturbed and flying, the male would give a short, rapid, continuous song or as often would fly without making any noise. The song seemed to resemble a mechanism that was wound up and released at frequent intervals for a split second, *e.g.*, a movie camera with the lever repeatedly pressed. Protective oblitative coloration was especially marked; a pale insect on pale plants on a hot desert.

The songs of many of the Okanagana are very similar and have few distinguishing characteristics. As a rule, the song is given only during the hottest part of the day, never at evening and rarely unless the insects are in the bright sunlight, even being stopped when the shadow of a cloud comes over. Captive specimens of *Okanagana bella* and *Okanagana striatipes* have been induced to sing when a vacuum cleaner was started.

Okanagana rubrovenosa Davis

At Gold Run, California, (elevation 3224 Ft., June 13, 1938)

Okanagana rubrovenosa were on the manzanita bushes, which in this locality grew from three to six feet in height. The cicadas were usually on the smaller branches and were often out toward the ends carrying the leaves.

The song, a shrill whistle, was stopped when the insect was approached and resumed if the observer remained quiet. During the song, the abdomen was elevated which had the effect of opening wider the tympanal cavities. Sometimes it would be continued while the insect was flying. In addition, a clicking sound was made by flicking the wings. The females probably can make the same sound, but those that were observed were quiet and did not even try to fly when collected. The same insects collected on manzanita in Washington County, Utah (July 6, 1930 and June 11, 1932) acted much the same, but did not click their wings.

Okanagana bella Davis

Okanagana bella as frequently observed in the canyons about the valleys of the Great Salt Lake and at Fish Lake, Sevier County, Utah (July 2, 1930) and Mt. Hood, Oregon (July 23, 1935) had the same even, high-pitched song of *Okanagana rubrovenosa*. If the two could be heard together, a difference might be detected. *Okanagana bella* is found on willows (*Salix* sp.) birch, quaking aspen (*Populus tremuloides*) and other trees in the canyons and often at higher elevations than other cicadas. The wing clicking, however, has not been observed with this species.

Okanagana vanduzeei Distant

Okanagana vanduzeei were found at several localities. At Mill Valley and Muir Woods, California (June 17, 1938) they were on the grass covered hills. The song was more even, but about the same pitch as that of *Okanagana striatipes* and their actions were very similar. They were active, flew readily and were difficult to approach. After flying, the insects would often circle back and alight, head upward, at a not very great distance from the starting point. At Union, Oregon (July 21, 1935) on a sage brush covered hill, the flight was often at a level above the sage, when suddenly they would drop to a lower level and continue until they crashed into another bush. At Soquel and Elsinore, California (1938) the insects were also on grass.

Okanagana californica Distant

Okanagana californica at Elsinore, California (June 24, 1938) was on grass and had a song and actions indistinguishable from those of *Okanagana vanduzeei*.

Okanagana luteobasalis Davis

Okanagana luteobasalis is only associated with the sage brush and is found over these areas on the plateaus of southern Utah. The type brood of this species was observed near the town of Hatch, Garfield County, Utah (June 5, 1931) on the Paunsaugunt Plateau. (Davis, 1935 p. 302. The type locality is in Garfield County, not Davis County.)

The brood had emerged just south of the town and to the east of U. S. Highway 89. In the area, which was about 100 feet in diameter, the sage was scrubby and only a foot or less in height and was quite definitely demarcated from the surrounding country. In this limited area were found thousands of exuvia, although the adults were beginning to spread out, the skins exactly marked the limits of the brood. Five to twenty could be found around every sage brush. It seemed probable that the large number of nymphs, feeding on the roots, had caused the plants to suffer over the limited area. With this in mind, the site was examined from an elevation west of the road and the area of scrubby sage and exuvia was essentially the same.

Most of the insects were easily captured as is usually the case with recently emerged broods. Some were copulating and others had just emerged and were still green, with limp, ghostly, pale green wings. The pronotum on either side of the mid line was the first to become dark. The ocelli stood out as orange spots and the compound eyes were brown. Some of the females were ovipositing on the sage, but most of them had chosen the rabbit brush. They would usually take about three minutes to the nest. One continued to work for ten minutes, but this may have been the last nest, as it was not filled with eggs and there were several other completed nests in a line on the stem above. All the ovipositing females were head down on the stems.

Just north of Nephi, Utah (June 26, 1938) in a sage brush field, a cicada was heard and when collected, was found to be

Okanagana luteobasalis. It was on the stem of the central part of the sage. No other of this species was found, although they were searched for. Other broods of the same species have always been in large numbers so this specimen may have been from a more distant location. In the same general region, *Okanagana utahensis* was also collected, but these insects were always on the leafy parts of the plant.

Okanagana utahensis Davis and *Okanagana striatipes* (Haldeman)

Most of the *Okanagana* songs are very similar and tend to be even and continuous. When they are singing in the same locality, slight differences in the quality become more evident. Both *Okanagana utahensis* and *Okanagana striatipes* are found on the sage brush and grass-covered foothill of the Wasatch Mountains, on the terraces of old Lake Bonneville, east of Salt Lake City. The songs have enough contrast to distinguish the insects by the sound alone.

At Fort Douglas, Utah (July 4, 1938) *Okanagana striatipes* were fairly numerous, alert and well scattered. A few exuvia were found on the ground or clinging to the plants. A female flew to a singing male, alighted on the stem, approached the male and then assumed a parallel position. The male's song was reduced to a few feeble clicks and copulation began. The act was timed and found to continue for 10 minutes, during which they were quiet and could be handled without attempting to escape.

In *Okanagana striatipes*, the song is loud for the size of the insect and it has a definite rapid undulating character giving a quivering effect. That of *Okanagana utahensis* is finer, more even and somewhat weaker even though the insect is larger.

Okanagana utahensis was the common cicada along the Wasatch Drive, southeast of Salt Lake City (July 3, 1938) on the sage brush flats. Most of the insects were located on the leafy parts of the plants. Only an occasional *Okanagana striatipes* was found. A female, *Okanagana utahensis*, was first observed as it crawled along side of a male whose song had been heard. Copulation immediately took place and the song was instantly discontinued. The act was timed and took 14 minutes during which time the insects clung to the sage in parallel positions.

Okanagana synodica (Say)

A large brood of *Okanagana synodica* was observed in Emery County, Utah (June 7, 1928). At first, the sound was mistaken for the humming of the carburetor of the car. In the field, so many were buzzing that it was impossible to locate the position of any individual. After examining the low, sage-like bushes, thousands of the insects were found. Fifteen or twenty could be easily collected on a bush not over a foot high. The note, similar to the typical *Okanagana* song, was not very loud, but shrill and long continued and what the individual lacked in volume was made up for by the large numbers. Very few would fly if disturbed, but would remain on the bushes and could be collected by hand. Others would become quiet when disturbed and fall to the ground, where their color closely resembled the buff colored soil. Many were mating. The exuvia were on the ground or attached to the stems.

Okanagana fumipennis Davis

Okanagana fumipennis as observed in San Juan County, Utah (June 8, 1928 and by H. W. Pickett, June 22, 1932) were on the wide sage brush flats of the region. They were easily captured, were poor flyers and if thrown in the air, they would fall to earth a few feet away. None voluntarily took to wing. The song was strong and long continued. Many exuvia were on the ground and clinging to the sage. This species was originally confused with *Okanagana schæfferi*, (Davis, 1932, 251).

Okanagana schæfferi Davis

The habits and songs of *Okanagana schæfferi* were entirely different from *Okanagana fumipennis* when the former was observed along the Mt. Carmel-Zion Park Highway in Utah (June 5, 1931). The insects were found only on the junipers (*Juniperis utahensis*) which were very common in the region. They were active and flew readily. A few were copulating. The song had a distinct metallic quality and when several were singing, the sound resembled the noise made by the safety razor blade sharpeners in the boot-black stands a few years ago. It was long-continued and louder than that of the smaller *Okanaganas*.

Platypedia mohavensis Davis

Platypedia mohavensis were in the same juniper trees with *Okanagana schæfferi*. Both sexes made a clicking sound by flicking the wings and because of the large number, the sound resembled a shower of hail or shot dropped on wrapping paper. These insects were not singing.

Platypedia putnami lutea Davis and *Neoplatypedia constricta* Davis

Both *Platypedia putnami lutea* and *Neoplatypedia constricta* were collected in South Willow Creek Canyon, Tooele County, Utah. In May (May 24, 1931) only the former had emerged and the next month (June 14, 1931) both were present. The songs were similar, not loud and both sexes of both species were making the wing-clicking sounds. They were found on rabbit brush (*Chrysothamnus* sp.) and sage (*Artemisia tridentata*). *Platypedia putnami lutea* have been collected on juniper in the Kaibab Forest (June 11, 1924) and on willow (*Salix* sp.) in the canyons of Salt Lake County, Utah (May 30, 1930).

Tibicinoides mercedita (Davis) and *Tibicinoides cupreo-sparsus* (Uhler)

Tibicinoides mercedita at Dixon, California (June 13, 1938) had a song very similar to that of *Okanagana vanduzeei* and other allied species. The smaller *Tibicinoides cupreo-sparsus* in San Diego County, California (June 12, 1931) had an even song, which was not very loud and was usually stopped before the insect could be located. The dark color gave a remarkable concealing coloration when the insect was clinging to the dark, dry twigs and branches of a small shrub.

Eighteen western species of seven genera of cicadas have been considered. Ten species were observed and collected during 1938 and to these notes have been added other observations made in recent years.